

where they are of such a nature as in Fig. 2, a triangular excision leaving the mesenteric attachment intact was followed by the best results, Fig. 6.

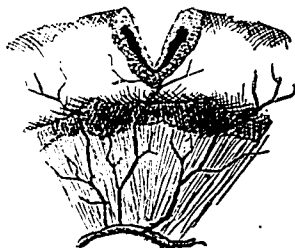


FIG. 6.—TRIANGULAR EXCISION OF THE WOUND.

Wounds upon the mesenteric border are always troublesome, and since excision upon the concave border is inadmis-

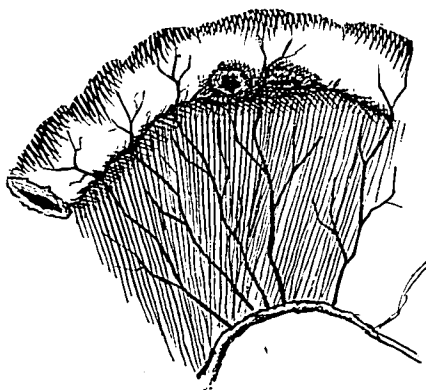


FIG. 7.—WOUNDS CREATED BY A FLOBERT. ONE OF WHICH SLIGHTLY INVOLVES THE MESENTERIC BORDER.

sible they frequently require complete resection. Those of a small size are conveniently closed by drawing together a fold

of the mesentery upon one side and the border of the intestine upon the other, but in those of a complete division of the mesenteric border, as in Fig. 3 and 8, resection is the only alternative. In re-uniting the divided ends of the intestine the operator has the choice of three methods, circular enterorrhaphy by the Lembert or Czerny-Lembert suture, invagination as recommended by Senn, which is but a modification of the same step by Baudens and Jobert, or lateral anastomosis by absorbable plates. Although experience has hardly established the comparative value of these, the lateral anastomosis



FIG. 8.—SHOWING TYPICAL INJURY OF THE MESENTERIC BORDER, REQUIRING A COMPLETE RESECTION.

as revived by Dr. Senn seems to be the operation of the day. When a small portion of the intestine is resected this can be accomplished without interfering with the mesentery, but in resections of two or more inches it should be accompanied with an excision of a corresponding triangle of the mesentery. Where a number of large wounds are situated close together, they are best dealt with by a single resection, including them all.

Non-penetrating wounds of various sizes and depths were repeatedly left untouched for a test of their security, and while no harm was traceable to them, still the safest method of their

treatment consists of their closure just as in penetrating wounds. In eventration the intestines during manipulation are best protected from shock by covering with disinfected towels which are kept warm by continuous irrigation of warm sterilized water, or, as was practiced in the experiments, by pouring from time to time warm sterilized water over the mass from a suitable vessel.

After all the discovered wounds are closed, a diligent and painstaking search of the entire gastro-intestinal tract should be made for any additional injury that possibly has escaped, and for the detection of such, as well as to prove the security of the intestinal closure, Senn's test is again recommended. The objections urged against the test as a diagnostic means of determining the necessity of a laparotomy cannot, at least in the same degree, be urged against it for this purpose.

So far there has been, to my knowledge, one case reported by Dr. Senn in which the test, in addition to eleven perforations, detected a twelfth, low down in the pelvis, which otherwise would have escaped, the patient recovering. Against this is the case reported by Dr. Dalton, in which this method of testing the gastro-intestinal tract occasioned serious damage by so distending the intestines that their return was exceedingly difficult, and even provoked a rupture of the sutured parts, seriously crippling the chance of recovery, the case terminating in death. In addition to the latter is another, occurring under the observation of Dr. Fenger,¹ in which, notwithstanding the use of the test, at the close of the operation an opening at the pyloric end of the stomach escaped. The following extract from the writer's language explains itself:

After all the apertures found were closed and the vessels tied, the intestines were replaced and gas again insufflated. The sutures proved to be absolutely air-tight. Some bubbles, however, escaped from the upper extremity of the incision, but Dr. Fenger thought that it came from the peritoneal cavity. The abdomen was flushed "et cætera." Autopsy one hour after death. On removing the intestinal tract the following appeared: (After reciting in detail the appearance the writer

¹J. L. Hillmantel, Jour. Am. Med. Ass'n, July 21, 1888.

closes the autopsy as follows: The second lateral apposition was found 11 inches below pylorus, where $2\frac{1}{2}$ inches of gut, with four perforations, had been resected. Finally, a perforation was found in the pyloric end of the stomach which was not sutured.

In the face of these two cases, the value of this method, as it now stands, is certainly questionable, since, in the first, it clearly points to a serious possible danger which has not only already occurred with Dr. Dalton, but Dr. Senn himself alludes to it as having been annoyed by the same thing, and in the second case its absolute certainty is very strongly shaken. Although apart from its not being absolutely infallible, if some means were at hand to rapidly relieve the distension, the test might prove itself a valuable adjunct to a careful research in detecting any additional perforation that might possibly have escaped. In a single experiment for the purpose, an incision was made into the large intestine with the hope of relieving the distention, but owing to acute flexures caused by the distention, this end was not reached till another was made into the small intestines, and a third into the stomach, the latter organ being partly filled with large pieces of meat, which prevented the exit of the gas through the pylorus, upon pressure. Judging from this, a simple incision which can be made under the control of the surgeon will hardly overcome the difficulty.

Wounds of the mesentery, when they are but perforations, can be passed without any additional interference, unless attended with hæmorrhage, in which case deligation of the injured vessel is required. Large lacerations should be closed with a running suture to avoid the future possibility of an incarceration and obstruction of a loop of the intestine in the opening. On account of the extreme delicacy of the membrane, its closure is often attended with some difficulty, which can be frequently overcome by introducing the sutures near the edge of a vessel, as this region affords the strongest grasp for the suture.

Wounds of stomach are treated according to the same rules as apply to injuries of the intestines.

Wounds of the liver. The recent advances in hepatic surgery by Tait, Langenbuch, Burkhardt and others show that the fear

from hæmorrhage, sepsis and the deleterious effects of bile upon the peritoneum are very much exaggerated. Lawson Tait¹ has a number of times successfully performed hepatotomy, removing from the liver substance immense quantities of hydatids. Burkhardt² succeeded in arresting a furious hæmorrhage from a stab wound of the liver by a tampon of iodoform gauze, and Dr. L. MacLane Tiffany³, in two operative cases, resorted primarily to the step of isolating an area of liver substance by uniting the edge of the parietal peritoneum with the surface of the liver, and through this extra-peritoneal area in one case he incised an abscess, and in another removed gall stones from the gall bladder, directly through the liver substance.

The wounds of the liver proper may either be simple abrasions, such as are produced by the ball glancing over its surface; clean cut perforations, or perforations attended with the loss of more or less liver substance. In abrasions of the liver the sear of the Paquelin will suffice, but generally the hæmorrhage ceases of its own accord. Such perforations as are hardly any larger than the ball itself are best controlled by closure of both openings with a continued catgut suture, introduced to the depth of two or three lines, and repeated two or more times after the weaving of a net work over its orifice. In the event of its failure to arrest the flow, or in perforations attended with the loss of hepatic substance, a tamponade of iodoformized gauze is the last resort. In perforations or lacerations at the free border of the liver, a V-shaped excision of the whole, uniting the surface with a running suture upon both sides, and if necessary doubly applied, recommends itself.

In wounds of the gall bladder, the closure of the apertures is best effected by either the Czerny or Rydygier's modification of the latter, using the continued suture in the first row, and the Lembert in the second. Before closure, unless already empty, evacuation and disinfection of the gall bladder should be observed.

¹Diseases of the Ovaries. Tait.

²Jour. Amer. Med. Ass'n, Vol. VIII, p. 323. Vol. IX, p. 62.

³Loc Cit Jour. Amer. Med. Ass'n, Vol. X, p. 785.

Cholecystenterostomy and cholecystectomy are operations to which the surgeon may be forced in the exigency of the case.

The experiments by Dr. Nicholas Senn¹ upon the pancreas have markedly advanced the surgery of this organ. They have shown that the tail or a portion of the body can be unhesitatingly removed, but operations upon the head should be of a conservative nature, not only for the purpose of sparing the common duct, but also as much of this portion of the organ as the conditions which necessitate the operation will permit. The complete extirpation of the pancreas was invariably followed by death, produced either by traumatism or gangrene of the duodenum. In transverse visceral wounds the arrest of hæmorrhage is the most important indication, and the suturing of the divided organ is advised with a view to preserving as nearly as possible the integrity of the blood supply rather than to secure the continuity of the pancreatic duct which, in division, uniformly results in an occlusion from a cicatrix. In case of extreme crushing, the indication is to remove the crushed portions after preliminary ligation of the organ on each side of the comminuted region. In using the double ligature the experiments show the safest plan to consist in the removal of such portions as are not supplied by blood vessels, rather than to trust to their absorption with the risk of proving a nidus for infection. In partial resections for injury or disease, ligaturing the peripheral portion and allowing it to remain is recommended as the most preferable step, since it lessens the danger by the infliction of less traumatism, and its removal in a short time, by absorption, can be confidently expected. It has also been demonstrated that no fear need be entertained of a retention cyst forming in the peripheral portion, even though some of the parenchyma of the organ remains.

Wounds of the spleen. In superficial abrasions, such as are produced by the glancing of the ball over its surface, the sear of the Paquelin, just as in lacerations of the liver, will usually

¹The Surgery of the Pancreas as Based upon Experiments and Clinical Researches. Transactions of Amer. Surg. Ass'n, 1886.

answer, but where the injury is of a severer nature, there are several procedures open. Should it consist simply of a perforation without much laceration of splenic structure, closure of both openings of the track with a continuous suture was uniformly successful when applied. In a perforation or laceration very near or involving the edge of the spleen, its excision in the shape of a triangle, uniting the edges with a running suture, is the most advisable step. Where the perforation involves a large vessel which precludes the closure of the track, or where the laceration is such that excision is unfeasible, the complete removal of the organ is required. It was observed that in partial resection or where the closure of the perforation with the suture was practiced, that the spleen rapidly increased in its size below the point of interference, as well as suffered a change in its color.

The changes which were apparently due to an interference with the venous circulation in the organ never gave rise to any trouble, and with the exception of one or two cases, upon subsequent examination, no traces of them were left. The changes which were apparent in the exceptional cases consisted of a slight atrophy, with a darkening in the color.

Wounds of the kidney and bladder. Unless the injury consists of a superficial laceration nephrectomy is as yet the only procedure in the treatment of these wounds. The superficial lesions are treated just as the similar injuries of the spleen and liver. The steps recommended for the repair of the gall bladder are also applicable to perforations of the urinary bladder.

General precautions. The last of the three leading indications is the treatment of the suppurative peritonitis that may follow consecutive to the injury. The treatment of this embraces prophylactic as well as curative measures. It is almost superfluous to repeat here that the strictest observance of the rules of antisepsis is of the utmost importance. Whether or not it is positively known that extravasation has occurred the cavity at the close of the operation should be carefully washed out with warm Thiersch's or some other suitable solution, and after drying close with the introduction of a glass or non-collapsible drain which is so arranged that without disturbing the

dressing access can be had to the abdominal cavity and if necessary the removal of any secretions affected. If the removal of such in this manner is insufficient, "febrile symptoms, tenderness, and tympanitis developing on the first few days after the operation," Gerster¹ favors the use of salines as advised by Tait. The track of the ball, which is another and not uncommon source of infection, can nearly always be sealed from within by its closure with two or more stitches applied after the manner of Lembert and where infection is probable should be treated externally by incision and drainage.

In the event of suppurative peritonitis having made its appearance, early opening and disinfection of the peritoneal cavity is indicated and for this purpose Mikulicz² and others have divided the peritonitis into two types. "*Diffuse, septic and progressive fibro purulent peritonitis*," both distinct but capable of merging into one another, the former being an acute or per acute peritonitis dependent upon the infection of a large portion of the peritoneal surface, which, unless it runs a per acute course with the symptoms of intoxication, is marked by the attendance of a variable amount of sanguino-serous or purulent putrid thin fluid exudation. The peritoneum is injected and at times covered by a thin fibrinous, deposit but firm and extensive adhesions are absent. The latter runs an acute or subacute course with infection limited to the vicinity of the perforation by the adhesions formed from the fibro-purulent exudation.

The process successively spreading with the encapsulation of more or less pus between the glued viscera.

For the first Mikulicz advises that of freely opening the abdomen with the finding and closure of the opening (if there be one) and the disinfection of the peritoneum.

In the second each intra-peritoneal pus cavity is opened separately by the free incision of the abdominal wall where it appears most prominent, and, following the incision, carefully washed out avoiding the rupture of the adhesions and in lieu of closure by sutures loosely packed with iodoform gauze

¹Loc. Cit. Annals Surgery, Jan. 1887, page 27.

²Gerster's Aseptic and Antiseptic Surgery.

with the possible introduction of a drain. Upon this principle Mikulicz has operated with some success, using as diagnostic indications the increased resistance, pressure sensitiveness, dullness and an increase of the previously lowered bodily temperature using in doubtful cases the exploratory puncture.

Dr. Wylie¹ in a recent and advanced paper upon this subject assumes a similar position as Mikulicz, strongly favoring early interference in the treatment of peritonitis. The succeeding lines represent an abstract from this writer's conclusion after an experience of several successful cases.

When there are symptoms of local peritonitis, intense pain and tenderness followed by tympanitis and vomiting with chilly sensation and rise of temperature, search should be made for the cause. If signs of a tumor or exudation can be definitely made out and the general symptoms indicate the formation of pus then the patient should be etherized and the pus reached by incision, the pus evacuated, the cavity washed out and drained. If the general symptoms are severe and no localized center of pus is made out then an incision should be made in the median line and the peritoneal cavity explored with the index finger. If then a pus sac is found, if it be so situated that it can be reached by another lateral incision and the pus evacuated without allowing it to escape into the free peritoneal cavity, it should be made and the median incision closed. If it cannot be reached by a lateral incision where the wall of the sac is adherent to the abdominal wall then the pus should be drawn off by an aspirator or trocar and the cavity washed out clean with an antiseptic solution before it is freely opened and a drainage tube inserted.

If signs of general peritonitis show themselves, that is by vomiting, obstinate constipation, tympanitis etc, then a free incision should be at once made into the median line and the starting point of the peritonitis found if possible. If it is over the cæcum an incision should be made and the pus washed out by means of hot water of a temperature of 110° to 115° from a large fountain syringe with a large glass drainage tube attached to the rubber. After the free pus about the cæcum is washed out several fingers or the whole hand should be put into the abdominal cavity and the intestinal adhesions broken up and

¹The Surgical Treatment of Local and General Peritonitis by W. Gill. Wylie, M.D. The Am. Jour. of Obstet and Diseases of Women and Children, March, 1890.

all puddles of pus completely washed out. Then a drainage tube should be introduced into the opening and the wounds closed around them.

In all cases of general peritonitis an exploratory incision should be made as early as possible after trying to lessen the tympanitis. If an exploratory incision does no good it is not likely to add much to the danger. There may be cases of idiopathic peritonitis but I have never seen one proved by anything to be relied upon. Certainly in septic peritonitis where shock is not too great free opening, washing out and drainage will cure some cases. It helps if it does not cure tubercular peritonitis and exploratory incision has proven to be in the hands of experts almost entirely free from danger and it must become the practice in almost all cases of general and local peritonitis where there are marked symptoms of the formation of pus, an extension "into septic peritonitis or intestinal obstruction"

In closing Dr. Wylie remarks: "What I wish to especially advocate, is early operation in cases of general peritonitis, both those starting from a local peritonitis and those due to the escape of septic matter into the peritoneum, and to make it plain that to succeed in such cases it will not do to merely open the belly, allow pus to escape, put in a drain tube or gauze and leave intestinal adhesions causing obstruction to remain, to kill even more certainly than septic poison or fail to empty and wash out all puddles of septic fluid encysted among the coils of intestines, but we must make free incisions large enough to introduce the hand and break up all adherent intestines and freely wash the whole cavity of the peritoneum and put in two or more drainage tubes."

From a study of the foregoing abstracts it does seem that the indications in the treatment are plain and reviewing the successes achieved by Mikulicz,¹ Krœnlein,² Tait,³ Wylie,⁴ Korniloff,⁵ and others, this certainly appears the most feasible and justifiable step.

¹Samml. klin. Vorträge von Volkmann, No. 262.

²Krœnlein, Langenbeck's Archiv, Bd. 23, S. 522.

³Brit. Med. Jour., 1883, Vol. 304.

⁴The Amer. Jour. Obst. and Dis. of Women and Children.

⁵Medizinskoje obosrenje, 1887, No. 12.